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EFFECT OF POULTRY MANURE ON GARLIC (*Allium sativum* L) PRODUCTION IN IBADAN, SOUTH WESTERN NIGERIA

Adewale O.M, Adebayo O.S and Fariyike T.A
Spices Research Programme, National Horticultural Research Institute,PMB 5432,Jericho G.R.A, Ibadan, Nigeria.

ABSTRACT
Garlic cultivation in the humid region of Nigeria is not common. Efforts to grow garlic in the south western region require fertilizer application to improve the bulb quality and overall yield. However the appropriate rate of fertilizers to use is still unknown. Therefore an experiment was carried out in Ibadan, South Western Nigeria to assess the effect of different rates of poultry manure on the yield of garlic. The treatments compared were five (5) poultry manure rates (0, 5, 10, 15, 20 t/ ha). The experiment was arranged in Randomized Complete Block Design (RCBD) with three replications. The lowest yield was obtained from the control; all the treatments had significantly higher yields than the control. The highest yield was recorded on plants that received poultry manure at 20 t/ha. This could be attributed to increased quantity of nutrients from this rate of poultry manure.

KEYWORDS: garlic, organic manure, bulb quality, location

INTRODUCTION

Garlic (*Allium sativum* L) is an annual spice crop of the family Alliaceae. It is an important bulb vegetable with several medicinal values and is used all over the world. Garlic is a multiple bulb consisting of of 6 – 20 smaller bulblets or segments called *cloves* covered with a protective thin membraneous sheath(Brewster,1994). A fresh bulb contains about 62.8% moisture, 6.3% protein, 0.1% fat, 0.8% fibre, and is a good source of carbohydrates, Vitamin C, Selenium, Phosphorus and Manganese (Pamplona-Roger,2001). It contains an amino acid *alliin*, an enzyme *alliinase* and on crushing the bulb, *alliinase* converts *alliin* into *alliicine* which is the major flavor in garlic (Yai and Radav, 2005).

Garlic is mainly used for flavoring and seasoning vegetable and meat dishes, the cloves are used to prepare soups, chutneys and could also be eaten raw, fried, boiled, roasted or baked. Its pungent flavor makes it useful for seasoning foodstuffs involving both green tops and bulbs. It is included in several seasonings such as curry powder, spice mixtures, ketchup and mayonnaise. Its medicinal value is appreciated in the control, management and treatment of worms, hypertension, germs, diabetes, cancer, ulcer, rheumatism, bacterial and fungal diseases. Its attributed hypocholesteromic and blood sugar- lowering properties are due to its alliin content. It also possesses insecticidal and repellent properties (Farooqui et al, 2004). Dehydrated garlic and extracts are used for industrial usage in the production of drugs, insecticides and explosives (Tindall, 1986).

Garlic is the second most important bulb vegetable after onion and it is grown worldwide in all temperate to sub tropical areas as an important spice and medicinal plant (Rabinowitch and Currah,2002).It can be grown on a wide range of climatic conditions but thrives best at mild climate without excessive rainfall and heat (Yai and Radav, 2004). Organized research work on garlic is few in the south western part of Nigeria and this has not kept pace with the wide spread cultivation of the crop in the northern part of the country, therefore there is the need to balance this scenario.

The problem of affordability and procurement of chemical fertilizers by resource-poor farmers make the use of poultry manures a viable alternative (Chen and Hammond, 1985). Also, the use of inorganic fertilizers alone cannot guarantee optimum yield that can meet demand, hence the need for organic fertilizers (Alasiri, 2002).

According to Yai and Radav (2004), crops cultivated with organic manures are not only free from harmful chemicals; they are also safer, healthier and tastier. They are of high nutritional quality and are devoid of all forms of pollution that arise from agricultural techniques. Apart from supplying plant nutrients, they improve soil physical and microbial properties and eliminate pollution of underground water (Akinfasoye and Akanbi, 2005).

Now that the worldwide food trends are changing towards organic agriculture with a marked health orientation, it is essential to embrace the production of organically cultivated crops and while boosting the production of healthy foods, biodiversity is also been enhanced.

Therefore this study was carried out to ascertain the response of garlic to different rates of organic fertilizer (poultry manure).

MATERIALS AND METHODS

The experiment was conducted at the National Horticultural Research Institute (NIHORT), Ibadan using a Randomized Complete Block Design (RCBD) with three replications. Treatments compared were five (5) rates of poultry manure (0, 5, 10, 15, 20 t/ha).

Soil samples were taken at 0 to 15cm depth from different parts of the field and were thoroughly mixed to form a composite sample. The soil sample was air-dried and passed through a 2mm and 0.5mm sieve for soil texture and chemical analyses. The soil sample was analyzed for pH, organic carbon, total nitrogen, available P, exchangeable Ca, K, Mn, Na and Mg as shown in Table 1. The beds measured 2 m by 3 m and well cured poultry manure that had been analysed was applied on the beds at rate 0, 5, 10, 15 and 20 t/ha one week before planting. Table 2 shows the chemical analysis of the poultry manure.

Individual cloves were detached from healthy garlic bulbs and weighed, those planted weighed between 2.5 and 3.0g. The very pungent variety popularly known as the *Ex – kofa* was used. Planting holes were dug and the cloves were planted at a spacing of 40 cm by 15 cm, a total of 90 cloves were planted per bed.

Hand weeding was done at the initial stage, later weeding was done manually using hoes when the seedlings had emerged.

Leaf count and plant height were taken from samples every forthnight from 6 weeks after planting(WAP) to 16WAP, harvesting was at 17 WAP when the foliage had turned brown and collapsed. Weight of bulb, size of bulb and number of cloves per bulb were taken and enumerated. Data collected were subjected to analysis of variance and means that were significantly different were separated using Least significant difference at 5% level of probability.

RESULTS AND DISCUSSION

The physio-chemical properties of the soil as shown in Table 1 gave the soil textural class as sandy loam, pH 6.1, organic carbon 0.41%, total nitrogen was 0.06%, available P was 29.4% and overall nutrient content was low. The analysis of the poultry manure used for the study as presented in Table 2 gave 2.13% as nitrogen,4.3% of available P and 23% of Organic carbon. This confirmed the findings of Voncir, *et al*.,(2007*)* who reported that soil reaction has a great influence on the availability of plant nutrients, which is generally highest between pH6.0 and 7.5. The result of the poultry manure revealed high content of nitrogen and other nutrients which indicates that high nutrient content is required for a successful growth and yield of garlic.

The effect of the organic fertilizer (poultry manure) on the yield and bulb quality is shown in Table 3.
All measured parameters plant height, number of leaves, average number of cloves, differed significantly at ($p < 0.05$) due to the addition of the poultry manure.

The lowest height was recorded from the plants that had no poultry manure. Plant height increased as the quantity of poultry manure increased. The highest plant height of 79.8 cm was obtained from those that received 20 t/ha. This

agrees with the findings of Majambu *et al*. (1985) that the plant height of okra increased significantly as the fertilizer rate increased. This also is in consonance with the findings of Atungu (2000) that Nitrogen enhances physiological activities in crops thereby improving the synthesis of photoassimilates.

The application of poultry manure also affected number of leaves as it increased with an increase in the quantity of the poultry manure applied. Plants that received poultry manure at 20 t/ha had the highest number of leaves while the control had the lowest number of leaves. This conforms with the findings of Frank (2000) that a general increase in vegetative growth was obtained when manures are applied to plants.

The number of cloves per bulb increased as the quantity of poultry manure increased. Plants that received poultry manure at 20 t/ha had the highest average number of cloves per bulb of 5.7, followed by those that received poultry manure at 15 t/ha with an average of 5.3 cloves per bulb. The ability of poultry manure to increase the performance of garlic could also be attributable to the fact that organic manures improves both physical and chemical soil properties (Yahaya, 2008)

Generally there was an increased performance of the crop on the parameters measured, bulb diameter, bulb weight and yield with increasing rate of poultry manure, this is in line with Aliyu and Kuchinda, 2002) that reported significant improvement in growth and yield with organic fertilizers. The highest yield of 14.3t/ha was recorded on plants that received poultry manure at 20t/ha. This may be due to the nutrients - N, Zn, Fe, Mn supplied from the poultry manure.

The cultivation of garlic in South West Nigeria could be a profitable enterprise as against popular belief if emphasis is placed on the use of fertilizers from organic sources.

CONCLUSION

From the findings in this study, the control i.e. plants that received no poultry manure had the lowest of all the measured parameters while the plants that received poultry manure at 20 t / ha had the highest of the measured parameters.

This implies that garlic responds well to organic fertilizer as the application of poultry manure influences its growth and yield.

Generally the yield from this trial was better than the yield from the traditional husbandry practices in the Northern parts of the country where the production of Garlic is more common. This implies that the addition of poultry manure in garlic production is a means of improving the yield in Nigeria and thus making its cultivation productive and sustainable.

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Table 1: Physical and chemical properties of the soil.

Properties	Soil values
pH	6.1
Total Nitrogen (%)	0.06
Organic carbon (%)	0.41
Available P (cmol/Kg)	29.4
Exchangeable Ca (cmol/Kg)	2.1
Exchangeable Mg (cmol/Kg)	0.6
Exchangeable K (cmol/Kg)	0.11
Exchangeable Na (cmol/Kg)	0.41
Exchange acidity (cmol/Kg)	0.10
ECEC (cmol/Kg)	3.2
Sand (%)	82.4
Clay (%)	6.4
Silt (%)	11.2
Textural class	Sandy loam

Table 2: physical and chemical composition of the poultry manure

Properties	Value
pH	6.5
Total Nitrogen (%)	2.13
Available Phosphorus (%)	4.33
Potassium (%)	0.12
Sodium (%)	0.18
Calcium (%)	3.76
Manganese (%)	1.14
Zinc (%)	0.13
Iron (%)	3.27
Organic carbon (%)	23

Table 3: Effect of poultry manure on bulb quality and yield of garlic.

Poultry manure (t/ha)	Plant height (cm)	No. of leaves	No. Of cloves / bulb	Bulb diameter (cm)	Bulb weight (g)	Yield (t/ha)
0	55.3	4.8	3.7	2.5	4.8	6.7
5	69.5	5.9	4.7	2.7	6.0	8.1
10	72.9	6.7	4.3	3.2	6.7	9.7
15	66.1	8.0	5.3	3.5	8.0	12
20	79.8	9.9	5.7	3.8	10	14.3
LSD (0.05)	4.7	0.7	0.4	0.3	1.5	1.4

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Corresponding author
Adewale O.M, Adebayo O.S and Fariyike T.A
Spices Research Programme, National Horticultural Research Institute,PMB 5432,Jericho G.R.A, Ibadan, Nigeria.
Corresponding author: yms_olb@yahoo.com